

High Efficiency Refrigeration Process, Phase II

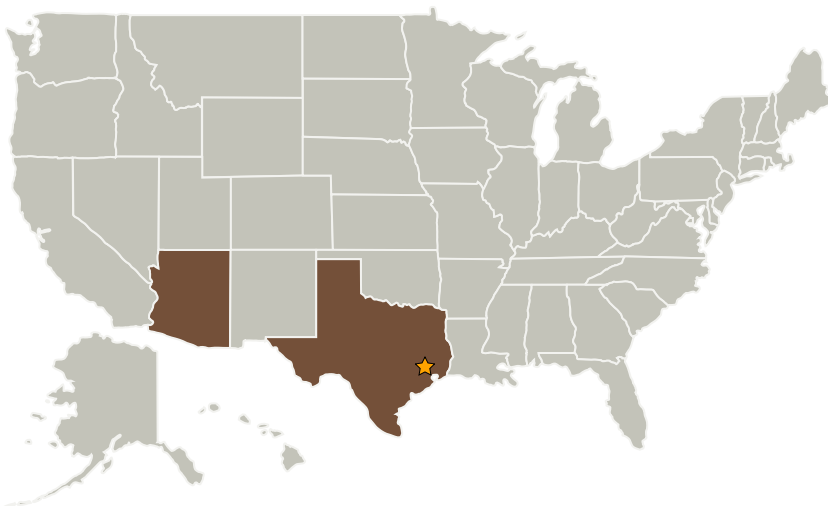
Completed Technology Project (2004 - 2006)



Project Introduction

It has been proposed by NASA JSC studies, that the most mass efficient (non-nuclear) method of Lunar habitat cooling is via photovoltaic (PV) direct vapor compression refrigeration. This system uses a thermal radiator, a solar PV array, and a vapor compression refrigeration device. Such a system significantly reduces total system mass as compared to an all radiator cooling architecture. Since the start of initial prototype testing in the mid 1990s, several refrigeration systems have been proposed, studied, built, and tested. The basic goal of each system has been to achieve the highest possible efficiency at the optimal system lift. Most notably, a two-stage refrigeration system and an expander turbine for a single-stage system were developed. Both sought to eliminate or recover the energy loss associated with irreversible expansion at the throttling valve, but both fell short of efficiency targets. Then, Paragon proposed a novel refrigeration architecture that was successfully demonstrated during the Phase I period. This system can achieve, in theory, near Carnot efficiency limits and does so in a practical and achievable way. Not only can this technology provide significantly improved performance (reduced weight) for NASA's Lunar habitat cooling application, but it has excellent potential as a commercial product.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
SunDanzer Development, Inc.	Supporting Organization	Industry	Tucson, Arizona

Primary U.S. Work Locations

Arizona	Texas
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.1 Cryogenic Systems
 - └ TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors